Flight of the living dead

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Publication date:
2017

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Document Version
Publisher's PDF, also known as Version of record

Link to Final Version:
https://theconversation.com/flight-of-the-living-dead-how-animation-brings-extinct-species-back-to-life-86737

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Flight of the living dead: how animation brings extinct species back to life

November 2, 2017 2.34pm GMT Updated November 3, 2017 9.41am GMT

Brendan animation crop.

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Who can forget Steven Spielberg's first Jurassic Park movie in 1993? How eagerly did we anticipate that bellowing T-Rex? Or gasp at the sheer scale of the brachiosaurus as it lumbered into view? Never before had animation been so lifelike and believable. I was hooked – this is what I wanted to do.

An animator's role is to design the movement of a creature or character. For 15 years I worked in visual effects for films where this was a useful skill – if a director wanted his hero to be attacked by a four-headed, six-legged dragon, I could use my knowledge of anatomy from existing creatures and my understanding of physics to design its movement. When I transferred to academia, it was not immediately apparent where this skill could be used in a research practice.

YouTube.

Then I realised it could be useful in recreating extinct species. Without the actual animal to study, artists have to bridge the gap between bones and the creature's fully fleshed appearance. Paleoartists – illustrators of extinct species have been doing this since the first fossils were found.

However, where a paleoartist is concerned with the look of the creature, I wanted to focus on its movement, combining existing knowledge and skills with detailed research into current palaeontological discoveries to create as accurate an animation of that species as possible. By focusing on the science – something professional animators rarely have time to do – and building it from a skeleton, I could acquire a deeper understanding of the creature and the way it moved.

Scotland's archaeopteryx guy

This year celebrates the 100th anniversary of the publication of On Growth and Form by renowned Scots zoologist D'Arcy Thompson, a professor of natural history at Dundee and St Andrews Universities for 63 years. So it was fitting in 2017 to animate a fossil from his large collection of zoological specimens at his museum in Dundee.

D'Arcy Thompson, a professor of natural history for 63 years at Dundee and St Andrews. ongrowthandform.org, Author provided

I was drawn to a rare cast of the Berlin Specimen of archaeopteryx – one of the earliest known descendants of modern birds. The archaeopteryx is an icon of evolution that helped to show the transition of dinosaurs to birds, and support the then new theory of evolution. Thompson refers to this in his book, describing how the hip-bones of archaeopteryx could be manipulated to form the hip-bones of more recent late-Cretaceous bird, Apatornis.

The fossil is not only vitally important scientifically, but is one of the most beautiful found, with its wings held aloft in an angel-like pose. First the delicate fossil was laser-scanned, then loaded into our computer animation program, Maya.

The key to animating it correctly would be the skeleton, and luckily the cast allowed me to clearly see the sizes and shapes of the limb bones. Then I researched bird movement, looking at chickens, jackdaws, lapwings, vultures, magpies and crows. Archaeopteryx is about the size of a crow and so I looked to them for the speed of movements, although they are built for walking, with long legs, like a chicken.

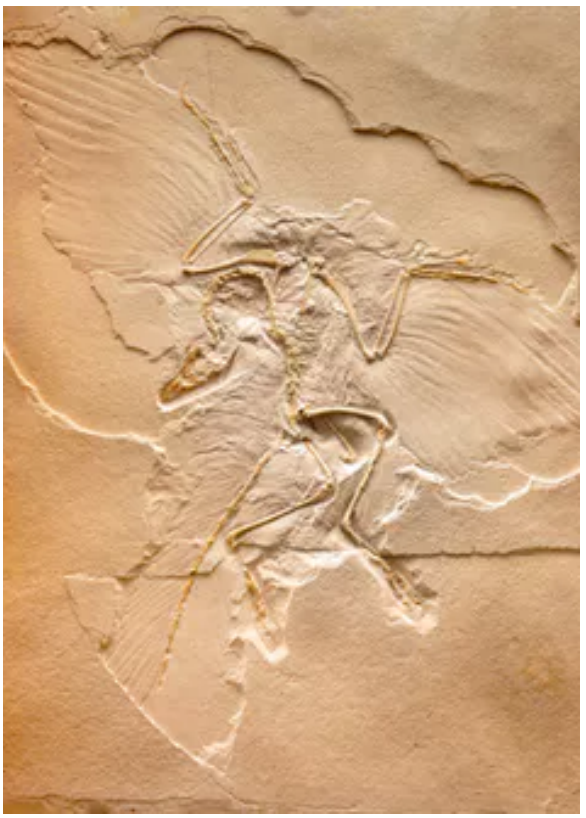
And there are differences between these modern birds and their Jurassic predecessor; the long tail of archyopteryx would mean that its centre of gravity and leg posture would be different. On a visit to the Royal Veterinary College in London, I was introduced to the XROMM machine which X-rays animals as they move – an incredibly useful resource for animation.

Social media reaction

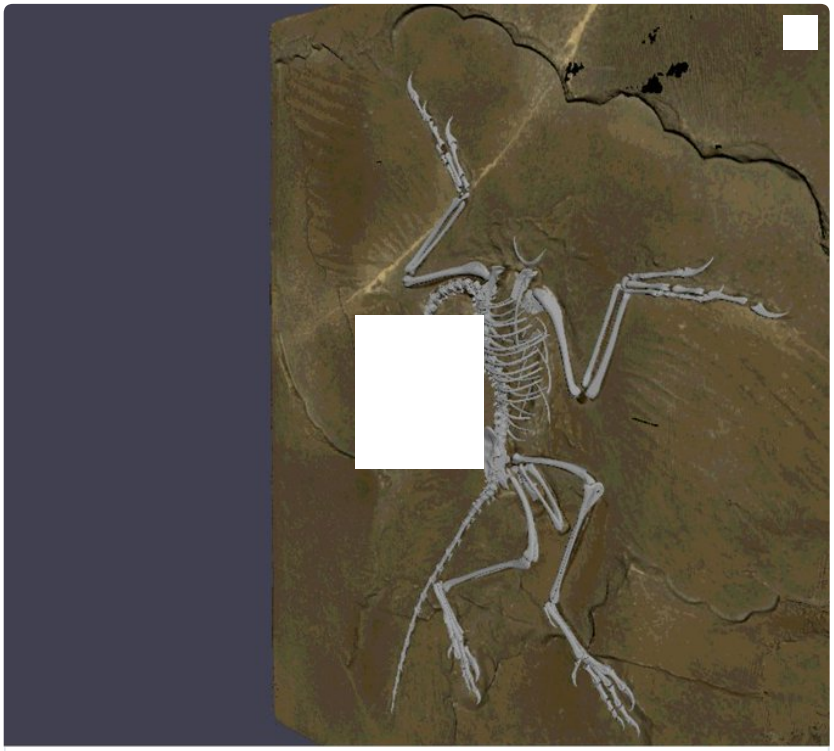
From X-rays I moved to animation tests to see how one movement would fit on the proportions of archaeopteryx. Then I thought it might be interesting to post my work on Twitter, so I created animated gif files to play automatically. Next I decided to hijack the paleontological hashtag #fossilfriday and posted my animation with the 3D scan of the fossil cast in the background. Not only did they prove popular, but palaeontologists and paleoartists gave me great feedback that was helpful as I refined my animation.

When top paleoartist Scott Hartman, with numerous scientific papers to his name, described my walk as a "very solid archaeopteryx walk cycle", that really made my day.

The most popular animated gif was of the skeleton emerging from the fossil, bone by bone, which then came to life. There is something magical about an animal reforming in front of your eyes, something broken becoming whole, something extinct and long dead coming back to life. It's something every dinosaur enthusiast wants to see.



A cast of the Berlin Specimen archaeopteryx from the zoological collection of natural historian D'Arcy Thompson.
Shutterstock



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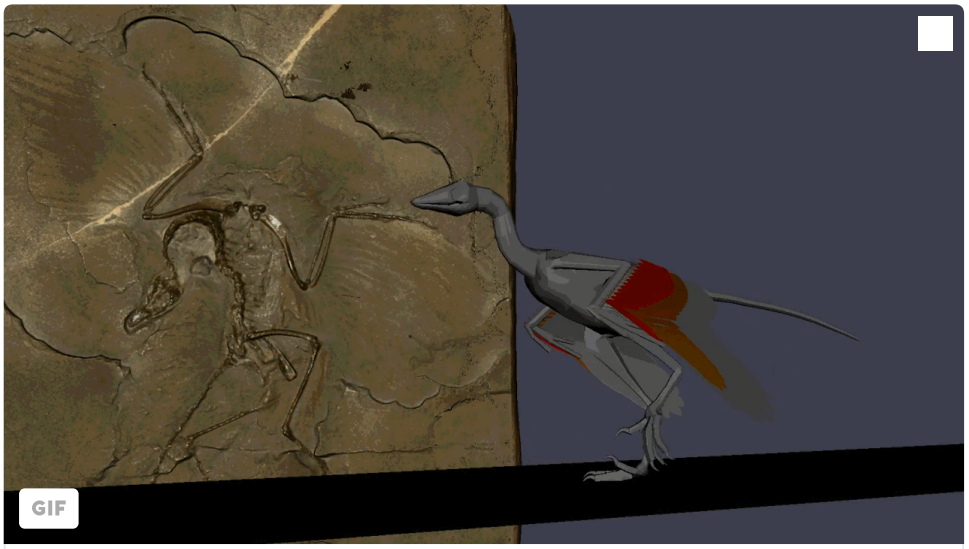
#archaeopteryx Assemble! #fossilfriday

10:22 AM - Aug 25, 2017

2,608 1,394 people are talking about this

So how did the archaeopteryx fly? It may have had wings to aid jumping and running, gliding down from a tree or to help it climb. There is even a theory that the archaeopteryx ran across water like a basilisk lizard, using its wings to prevent it from sinking into the water.



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Did #archaeopteryx fly or just fall with style? #fossilfriday

11:13 AM - Jul 14, 2017

263 140 people are talking about this

At the moment there is no clear consensus, so the final animation was more of an exploration of current ideas and theories. My archaeopteryx flapped and jumped to catch a dragonfly then ran with its wings out and flapping, then flew and finally glided back to earth.

But it was important to connect the animated archaeopteryx to the fossil, to increase understanding of the animal, not upstage or distract from it. The animation was projected on to a perspex prism containing a 3D print of the fossil cast, which provided a holographic effect where the bones seemed to emerge from the fossil, reform as the animal, then disappear again, leaving the viewer looking at the fossil with new eyes.

There is still so much to know about the archaeopteryx. As new specimens are found and new discoveries made, the artworks will need to reflect those changes. Like scientists, paleoartists need to change their views according to new evidence. So the time will come again when I return to my archaeopteryx and make it fly once more.

Evolution Birds Dinosaurs Fossils Animation Archaeopteryx Dundee